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Krill: The mass occurrence of a small crustacean – still an attractive research topic

To the delight of the benthologists, the week started with benthos sampling. In Erebus and the Terror Gulf station work was carried out. First observations show diverse benthic faunas ranging from surprisingly poor benthic communities in 200m water depth on the open shelf to an unusual soft bottom fauna at deeper water depths and a very diverse species community in the northern part of this large bay.

This area is named after two English sailing ships (HMS Erebus und HMS Terror) which became famous in this area of Antarctica when James Clarke Ross used them for 3 expeditions to the south (1840 - 1843). After the Antarctic expeditions, these ships carried the well-known Franklin-Expedition to the Arctic to discover the North-West Passage where they went missing never to be found. In their honor, two large active volcanoes 'on the other side' of Antarctica were also named after them, whereat Erebus is named after the Greek god of the darkness (Wikipedia).

After the successful benthic catches, we recommenced the oceanographic and krill transects. These transects are carefully selected track lines with sampling stations at regular intervals.

In this weekly report, the krill work is presented a bit more in detail. Being a rather independent aspect of the biological work on board, the krill work is integral part of the "Commission on the Conservation of Antarctic Living Resources" (CCAMLR) project. During this cruise, it is linked to the oceanographic and cetacean research. Volker Siegel, one of the world's leading krill experts from the 'Thünen Institute of Sea Fisheries' in Hamburg, is heading the krill research group. He is supported by a team of colleagues from his institute, the German Centre for Marine Biodiversity Research (DZMB) and a US colleague from NOAA. Since the beginning of the German krill research in the 1970's, a key question remains as to whether the Krill stocks of the southwest Atlantic only originates from an area west of the Antarctic Peninsula or if a second source exists east of the Antarctic Peninsula in the Weddell Sea. For the management of the Krill stocks, the information on its compositions is of central importance. It is, however, often difficult to obtain due to the sea ice conditions in the Weddell Sea. The initial plan for this cruise was based on the fact that the Weddell Sea has been relatively accessible in austral summers during the last decade. The rather severe ice conditions this year have, therefore, caught us by surprise and are causing some challenges for the krill research during this cruise. To adapt to the ice situation, the initial research area was extended northward. Even though this area of the Southern Ocean was also mostly ice covered, we made good progress. On the bridge, almost all the time, members of the krill team and the nautical personnel searched the ice covered sea for small areas of open water, so-called leads, large enough to deploy the Rectangular Mid-water Trawl (RMT). Whenever an opportunity arose, the RMT was deployed even if the actual position differed from the planned station. Once retrieved, the RTM catch was sorted into the three dominant krill species and the remaining plankton (e.g. copepods, jelly fish and arrow worms). The krill samples were then further sub-sampled, individual krill specimens were measured and their genders were determined. Afterwards, all samples were preserved further analysis back on shore. Preliminary results of the



Fig. 1: The RMT being deployed. © Christina Fromm, Thünen Institute



Fig. 2 A krill sample after the catch. © Volker Siegel, Thünen Institute

krill research indicate that the plankton from under the ice has a relatively low diversity. Comparing these results with the results from transects we did in open waters around Elephant Island shows that the krill is obviously less abundant under the ice than in the open water. The open water trawls also contained adult krill specimen while the trawls under the ice contained almost only juvenile specimen.

So far, most of the trawls were successful and only few stations had to be canceled due to ice conditions. The experts are the best to judge the value of the many successful stations even though the gaps are a small nuisance. On board the researchers work 24/7. To accommodate this demand, one deck hand more is required in addition to the normal decks crew. Among the scientist, Annika, Christina and Ryan cover the one shift and Volker and Ute the other. In this way, they can make optimal use of their precious time on Polarstern. The krill sampling program will soon be successfully finished but sorting work and analyses will continue. Volker and his team want to leave the ship with a complete data set and the first set of initial results at the end of the cruise. It is anticipated to present these results already at a meeting of the CCAMLR working group in Bremerhaven in July. The outcome of this meeting will be included in conservation measures to be decided during the annual CCAMLR meeting this autumn.

For the general biological work to come, we are currently discussing a 'plan B'. Our good progress through mostly brittle ice so far has raised hopes that we might be able to do at least some of the initially planned work in the Larsen area. There are still some diverging opinions about some of the details but further discussions and especially the ice conditions in the Larsen area will dictate the final decision. The goal will, however, be to find a compromise that maximizes the number of valuable stations while supporting an ecological approach and using the ship time efficiently. In the next weekly report, we will present our final decision and why.

The atmosphere on board differs between relief about our good achievements so-far and excitement about what is to come.

On behalf of all participants, I send our best greetings ashore.

Julian Gutt



Fig. 3: Whenever weather permits, helicopter whale surveys supplement the krill research. In any case a nice target for a photo. © Torsten Albrecht, PIK